

CLAIMS

1. A method for installing a refrigeration device that comprises:

a heat source unit (2 - 802, 1002, 1102, 1502 - 1802, 2002, 2102, 2502 - 2802, 3002, 3102) having a compressor (21) and a heat-source-side heat exchanger (23);

5 a utilization unit (5, 3005) having a utilization-side heat exchanger 51; and a refrigerant connection pipe (6, 3006, 7, 3007) for connecting said heat source unit and said utilization unit, comprising;

10 a refrigerant circuit formation step for forming a refrigerant circuit (10, 3010, 3110) by connecting said heat source unit and said utilization unit via said refrigerant connection pipe; and

15 a non-condensable gas discharge step for operating said compressor, recirculating the refrigerant in said refrigerant circuit, cooling and separating at least a portion of the refrigerant that flows between said heat-source-side heat exchanger and said utilization-side heat exchanger into a liquid refrigerant and a gas refrigerant that includes the non-condensable gas remaining in said refrigerant connection pipe, separating said non-condensable gas using a separation membrane (34b, 1034b, 2063b, 2064b) from said gas refrigerant obtained by gas-liquid separation, and discharging the non-condensable gas to the outside of said refrigerant circuit.

20 2. The method for installing a refrigeration device as recited in Claim 1, wherein

in said non-condensable gas discharge step, the refrigerant that flows between said heat-source-side heat exchanger (23) and said utilization-side heat exchanger (51) is separated into a liquid refrigerant and a gas refrigerant that includes said non-condensable gas, after which said gas refrigerant obtained by gas-liquid separation is cooled.

25 3. The method for installing a refrigeration device as recited in Claim 1 or Claim 2, further comprising:

an airtightness testing step for testing the airtightness of said refrigerant connection pipe (6, 3006, 7, 3007) prior to said non-condensable gas discharge step; and

30 an seal gas releasing step for releasing into the atmosphere the seal gas to reduce the pressure thereof inside said refrigerant connection pipe after said airtightness testing step.

4. A refrigeration device (1 - 801, 1001, 1101, 1501 - 1801, 2001, 2101, 2501 - 2801, 3001, 3101) comprising a refrigerant circuit (10, 3010, 3110) in which a utilization unit (5, 3005)

having a utilization-side heat exchanger (51), and a heat source unit (2 - 802, 1002, 1102, 1502 - 1802, 2002, 2102, 2502 - 2802, 3002, 3102) having a compressor (21) and a heat-source-side heat exchanger (23) are connected via a refrigerant connection pipe (6, 3006, 7, 3007), said refrigeration device further comprising:

5 a cooler (32, 332, 832) that is connected to a liquid-side refrigerant circuit (11, 3011, 3111) for connecting said heat-source-side heat exchanger to said utilization-side heat exchanger, and that cools at least a portion of the refrigerant that flows between said heat-source-side heat exchanger and said utilization-side heat exchanger as said compressor is operated and the refrigerant is recirculated in said refrigerant circuit;

10 a gas-liquid separator (33) for separating the refrigerant cooled by said cooler, into a liquid refrigerant and a gas refrigerant that includes the non-condensable gas remaining in said refrigerant connection pipe; and

 a separation membrane device (34, 1034, 2034, 2134) having a separation membrane (34b, 1034b, 2063b, 2064b) for separating said non-condensable gas from the gas

15 refrigerant obtained by gas-liquid separation using said gas-liquid separator, for discharging to the outside of the refrigerant circuit said non-condensable gas separated by said separation membrane.

5. The refrigeration device (1 - 701, 1001, 1101, 1501 - 1801, 2001, 2101, 2501 - 2801, 3001, 3101) as recited in Claim 4, wherein

20 said liquid-side refrigerant circuit (11, 3011, 3111) further has a receiver (25) capable of collecting the refrigerant that flows between said heat-source-side heat exchanger and said utilization-side heat exchanger; and

 said cooler (32, 332) cools the gas refrigerant including said non-condensable gas that is separated into gas and liquid inside said receiver.

25 6. The refrigeration device (1 - 801, 1001, 1101, 1501 - 1801, 2001, 2101, 2501 - 2801, 3001, 3101) as recited in Claim 4 or Claim 5, wherein

 said cooler (32, 332) is a heat exchanger that uses as a cooling source the refrigerant that flows through said refrigerant circuit.

7. The refrigeration device (1 - 201, 401, 501, 701, 1001, 1101, 1501 - 1801, 2001, 2101, 2501 - 2801, 3001, 3101) as recited in any one claim of Claim 4 through Claim 6, wherein

30 said cooler (32) is a coiled heat transfer tube disposed inside said gas-liquid separator (33).

8. The refrigeration device (1 - 301, 501 - 801, 1001, 1101, 1501 - 1801, 2001, 2101, 2501 - 2801, 3001, 3101) as recited in any one claim of Claim 4 through Claim 7, wherein

said gas-liquid separator (33) is connected so that the liquid refrigerant that is separated into gas and liquid in said gas-liquid separator is returned to said receiver (25).

9. The refrigeration device (701, 801) as recited in Claim 8, wherein

5 said gas-liquid separator (33) is integrally formed with said receiver (25).

10. The refrigeration device (501, 601, 701) as recited in any one claim of Claim 4 through Claim 9, wherein

 said separation membrane device (34) is integrally formed with said gas-liquid separator (33).